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Condition Monitoring for Gearboxes

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Condition Monitoring for Gearboxes

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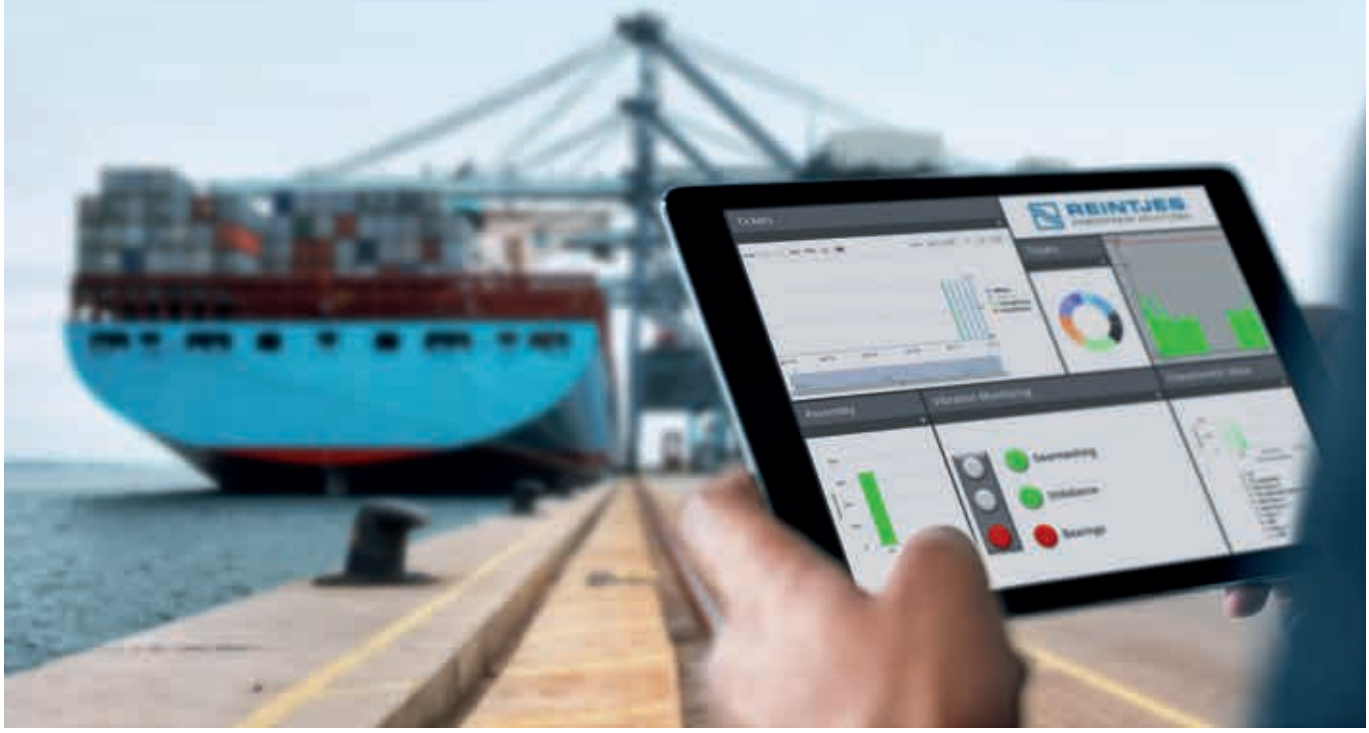
REINTJES is renowned for the production of high-quality, reliable maritime gearboxes – built for many years of continuous operation. The Hamelin-based company relies on continuous condition monitoring for early fault detection and failure prevention. With initial monitoring systems already in operation, the maritime specialists are now exploring AI solutions and data comparison across entire fleets.



»Thanks to Bachmann's CMS, we can regularly provide our customers with clear directions and proactively alert them to impending malfunctions.«

Marco Warnebold,
Condition Monitoring Engineer, REINTJES GmbH

Gearboxes in View

The reliable operation of maritime vessel gearboxes is one of Reintjes' main priorities. For Marco Warnebold, Condition Monitoring Engineer at Reintjes, continuous condition monitoring is the key: "By monitoring relevant process parameters, we gain a better understanding of the real-world operating conditions of our gearboxes and can use this know-how to optimize future developments. We can also identify potential problems at an early stage." The timely procurement of replacement parts, as well as quicker response times for on-site interventions, leads to higher vessel availability.

Reintjes continuously stores and monitors process parameters using Bachmann's Condition Monitoring System (CMS), which is visualized on a web-based dashboard. Standard monitoring can be expanded to include vibration monitoring and analysis. "Thanks to the accurate recording of highly dynamic vibrations, we can localize any problems and identify their causes," says Warnebold, highlighting a significant advantage of the Bachmann solution. Customers are provided with regular reports, including clear recommendations and timely information on impending malfunctions. Reintjes carries out vibration signal evaluation, which can then be independently evaluated by Bachmann's remote monitoring service.

If required, Reintjes offers additional monitoring possibilities with highly dynamic torque monitoring and oil quality monitoring. "Accurate, up-to-date oil condition monitoring allows customers to optimize and extend cost-intensive oil change intervals. In addition, this avoids the use of aged oil, reducing wear," explains Warnebold.

Practical Experience

Reintjes has been producing condition-monitored gearboxes since 2018. For CMS, the company relies on Bachmann's cost-effective and compact MX213. The GIO212 ensures compatibility with all common sensors. "This allows us to flexibly adapt our systems to the required application," says Warnebold. With the AIC214 module, Reintjes precisely records the structure-borne noise of up to two gearboxes, including the automatic calculation of RMS values. "The whole system is modular and expandable to several machines – ideal for more complex systems. For example, on a high-speed ferry that operates between Tenerife and Gran Canaria, we use two CMS systems to monitor four gearboxes," explains Warnebold.

The acquisition of reliable trend analyses proved a challenge during the first CMS implementation. Reintjes had to account for dynamic driving conditions, as well as changing speeds and torques, through targeted classifications. But complex gearbox kinematics also placed high demands on developers, especially as the engine and ship propellers also exert a considerable influence on gearbox vibration behavior.

A Simple and Comprehensive Overview

Reintjes's goal is to offer a monitoring solution that easily integrates into customer systems. With this in mind, Marco Warnebold values the M1 controller's extensive fieldbus protocol support and flexible interfaces: "Thanks to Bachmann's solution, our customers receive important operational information directly to control room monitors, removing the need for additional visualization units."

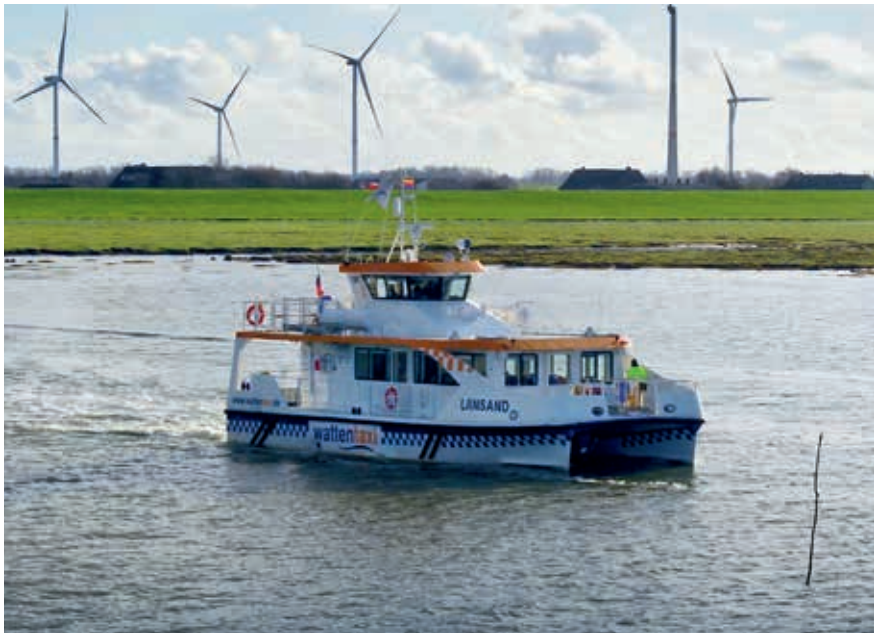
A current priority for Reintjes is the development of a supplementary web-based dashboard. This will act as a management tool, as well as providing various statistical operation evaluations, without the need for additional software. "This dashboard can include statistics on load profiles, efficiency and much more," says Marco Warnebold. Among other applications, it can be used to monitor the frequency of driving mode selection, when the last filter change took place, or when the next scheduled oil change is due. The range of functions can be easily expanded, depending on the availability of relevant sensors.

Learn and Improve

Reintjes sees a great deal of untapped potential in Bachmann's CMS. The company is now working intensively on future monitoring concepts: "Once sufficient systems are in operation, we could compare entire fleets with corresponding machine learning algorithms and gearbox digital twins," suggests Warnebold. Hendrik Harting, Head of Validation & Automation at Reintjes, is certain that this will ultimately benefit ship operators: "For every gearbox, we know the design, gearing data, and date of manufacture. If we can compare the performance of a particular assembly with similar systems on other ships, we can provide operators with specific, customized advice to maximize the service life of gear components."

Bachmann is also constantly working on new, more accurate approaches to predict the condition of Reintjes gearboxes. For example, using artificial intelligence to explore the separation of kinematic frequencies and structural natural frequencies, in order to obtain reliable structural condition information. However, according to Holger Fritsch, Managing Director of Bachmann Monitoring, structural health monitoring is only one of many research avenues: "We are currently working on a synthetically-generated speed indication. This would allow gearbox manufacturers to dispense with tachometers, thus eliminating a potential error source."

Successful pilot project: Continuous monitoring has been in use on the Liinsand ferry gearbox since 2018. REINTJES has been constantly developing its CMS solution ever since.



REINTJES GMBH

- Founded in 1879 and headquartered in Hameln, Germany
- Employs over 500 people
- An international group of companies specializing in propulsion technology: REINTJES manufactures marine gearboxes for main drives, dredger gearboxes, pod drives for yachts, hybrid drive systems, along with turbo gearboxes for gas and steam turbines and compressors.

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